

State of Hawaii  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
Division of Aquatic Resources  
Honolulu, Hawaii 96813

March 27, 2009

Board of Land  
and Natural Resources  
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National  
Monument Research Permit to Carl Meyer, University of Hawaii, Hawaii Institute of Marine  
Biology, for Access to State Waters to Conduct Shark Movement Research Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument research permit to Carl Meyer, assistant researcher, Hawaii Institute of Marine Biology, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter 13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

The research permit, as described below, would allow entry and activities to occur in the Papahānaumokuākea Marine National Monument (Monument), including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following sites:

- French Frigate Shoals

The activities covered under this permit would occur from April 1, 2009 through September 30, 2009.

The proposed activities are a renewal of work previously permitted and conducted in the Monument.

INTENDED ACTIVITIES

The applicant proposes to equip large sharks with electronic tags, and monitor their movements using acoustic receivers (deployed on the sea floor) and satellites. The purpose of the applicant's research is to provide Monument managers with empirical data on shark movement patterns at French Frigate Shoals atoll. This information is important for a better understanding of shark predation on Hawaiian monk seals and selecting appropriate management and mitigation strategies. The research project has the following specific goals and objectives;

1. Download 8 underwater receivers currently stationed at French Frigate Shoals to retrieve stored movement data from sharks tagged with acoustic transmitters in 2008;

2. Determine the movement and habitat utilization patterns of these sharks, particularly the frequency and timing of visits by Galapagos and Tiger sharks to monk seal pupping sites inside the atoll lagoon;
3. Improve receiver coverage by deploying up to 30 additional underwater receivers at French Frigate Shoals;
4. Equip up to 100 additional Galapagos sharks and 50 Tiger sharks with acoustic tags detectable by a listening array. These tag deployments will allow applicant to reach adequate sample sizes for this research.

While the researchers and field team carrying out these activities have been based on the NOAA ship HI'IALAKAI in the past, it is currently proposed that field personnel would be based primarily at Tern Island field station with supplemental ship-based activities. Shark tagging would occur in the shallow waters (<100m) around FFS and would be conducted from small boats launched from Tern Island. Servicing of receivers would be done by snorkelers and SCUBA divers.

In addition to servicing existing receivers, researchers would create several new temporary receiver moorings at sites described in the permit application using a system that has been demonstrated to successfully withstand seasonal high surf. Moorings would consist of sand screws in areas of soft sediment, and chain around uncolonized substrate in hard bottom areas (live substrates will be avoided). The receivers would be anchored to the moorings and suspended 1-4 m above the ocean floor. The receivers would identify and record the presence of any acoustic transmitters within range (up to 500 m). Researchers would remove these moorings when acoustic monitoring is completed (receivers would be in place for at least 2 years).

Researchers would also implant acoustic transmitters into 2 species of sharks (Galapagos and Tiger) at French Frigate Shoals. Target species would be captured by handlining (using a single baited hook), and using a bottom-set, 10 hook shark line. Captured sharks would be brought alongside the skiff, tail-roped and inverted to initiate tonic immobility. In this trance-like condition, sharks remain docile while transmitters are surgically implanted through a small incision in the abdominal wall. The incision would then be sutured closed, the hook removed and the animal released. This entire handling process can be completed in less than 10 minutes. Predator handling & tagging activities would be carried out in accordance with the animal use protocols of the University of Hawai'i (protocol #05-053-3).

The activities proposed by the applicant directly support the Monument Management Plan's priority management needs 3.1 – Understanding and Interpreting the NWHI (through action plan 3.1.1 – Marine Conservation Science) and 3.2 – Conserving Wildlife and Habitats (through action plan 3.2.1 – Threatened and Endangered Species).

The activities described above may require the following regulated activities to occur in State waters:

- ☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving monument resource

- ☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- ☒ Anchoring a vessel
- ☒ Discharging or depositing any material or matter into the Monument
- ☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- ☒ Attracting any living Monument resource
- ☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

#### REVIEW PROCESS:

The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since October 10, 2008 giving the public ample opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

#### **Comments received from the scientific community are summarized as follows:**

Scientific reviews support the acceptance of this application.

Concerns raised were:

1. If by-catch would likely occur, and if so, how it would be mitigated or minimized
2. If fishing gear poses hazard for seabirds
3. In the unlikely event of incidental shark mortality, if the shark would be used for other purposes

#### **Comments received from the Native Hawaiian community are summarized as follows:**

Cultural reviews support the acceptance of this application. No concerns were raised.

#### **Comments received from the public are summarized as follows:**

No comments were received from the public on this application.

#### **Additional reviews and permit history:**

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g. MMPA, ESA, EA)      Yes ☒      No ☐

If so, please list or explain:

- The proposed activities are in compliance with the National Environmental Policy Act.

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐

If so, please summarize past permits:

- The applicant was granted permits DLNR/NWHI/06R003, PMNM-2007-031 and PMNM-2008-027 to conduct similar work in 2006-2008.

Have there been any a) violations: Yes ☐ No ☒  
 b) Late/incomplete post-activity reports: Yes ☐ No ☒

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

#### RESPONSE:

1. The applicant states that by-catch is dependent on the method used:
  - Shark lines: By-catch is extremely rare due to large bait size and bait type. Rarely (<1 in 20 sets) large ulua or kahala are captured.
  - Baited handlines: By-catch is zero. The hook is observed at all times and removed from the water if approached by non-target species.
2. The applicant states that they have had no seabird interactions with shark gear in the past, nor do they anticipate any. The shark gear is very heavy duty and the baits are large, with neither posing threats to seabirds.
3. The applicant reiterates that they aim for zero mortality. He states that they could retain skin and jaws for Hawaiian cultural uses. He also points out there is an urgent need for Galapagos shark vertebrae for age and growth studies and that other tissues could be retained for a variety of scientifically useful purposes (e.g. population studies, ecotoxicology)

#### STAFF OPINION:

DAR staff is of the opinion that Applicant has properly demonstrated valid justifications for his application and should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with the following special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Research Permit General Conditions. The following special conditions have been vetted through the legal counsel of the Co-Trustee agencies.

1. To prevent introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocols attached to this permit.

2. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.
3. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State Marine Refuge
4. No fishing is allowed in State Waters except as authorized under State law for subsistence, traditional and customary practices by Native Hawaiians.

MONUMENT MANAGEMENT BOARD OPINION:

The MMB is of the opinion that the Applicant has met the findings of Presidential Proclamation 8031 and this activity may be conducted subject to completion of all compliance requirements. The MMB concurs with the special conditions recommended by DAR staff.

RECOMMENDATION:

“That the Board authorize and approve, with stated conditions, a Research Permit to Carl Meyer, Hawaii Institute of Marine Biology.”

Respectfully submitted,

  
for DAN POLHEMUS  
Administrator

APPROVED FOR SUBMITTAL

  
LAURA H. THIELEN  
Chairperson

**Papahānaumokuākea Marine National Monument**  
RESEARCH Permit Application

***NOTE: This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).***

**ADDITIONAL IMPORTANT INFORMATION:**

Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.

In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.

Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

**INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED**

Send Permit Applications to:

Papahānaumokuākea Marine National Monument Permit Coordinator  
6600 Kalaniana'ole Hwy. # 300  
Honolulu, HI 96825  
[nwhipermit@noaa.gov](mailto:nwhipermit@noaa.gov)  
PHONE: (808) 397-2660 FAX: (808) 397-2662

**SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.**

## **Papahānaumokuākea Marine National Monument Permit Application Cover Sheet**

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

### **Summary Information**

**Applicant Name:** Carl Meyer

**Affiliation:** Hawaii Insitute of Marine Biology

**Permit Category:** Research

**Proposed Activity Dates:** April 1 2009 - September 30 2009

**Proposed Method of Entry (Vessel/Plane):** Vessel/Plane.

**Proposed Locations:** Shallow water habitat (<100m) around French Frigate Shoals

**Estimated number of individuals (including Applicant) to be covered under this permit:**

5

**Estimated number of days in the Monument:** 90

**Description of proposed activities:** (complete these sentences):

a.) The proposed activity would...

Quantify the movements of sharks at French Frigate Shoals Atoll to improve our understanding of shark predation on Hawaiian monk seals.

b.) To accomplish this activity we would ....

Equip large sharks with electronic tags, and monitor their movements using acoustic receivers (deployed on the sea floor) and satellites. Sharks are captured using handlines and 10 hook bottom-set lines, restrained alongside a small boat during transmitter attachment and then released. Acoustic receivers are deployed and recovered by SCUBA divers, and listen year-round for predators equipped with acoustic tags.

c.) This activity would help the Monument by ...

The purpose of our research is to provide Monument managers with empirical data on shark movement patterns at French Frigate Shoals atoll. This information is vital for a better understanding of shark predation on Hawaiian monk seals and selecting appropriate management strategies for mitigating predation impacts on monk seals.

**Other information or background:** Our research has minimal impact on monument resources. Sharks are captured, tagged and released at their capture locations. Our listening stations (acoustic receiver + moorings) are designed to have minimal substrate impact and leave nothing behind when they are removed. We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

## **Section A - Applicant Information**

### **1. Applicant**

Name (last, first, middle initial): Meyer, Carl, G.

Title: Assistant Researcher

#### **1a. Intended field Principal Investigator (See instructions for more information):**

TBD

#### **2. Mailing address (street/P.O. box, city, state, country, zip):**

[REDACTED]

Phone:

[REDACTED]

Fax:

[REDACTED]

Email:

[REDACTED]

For students, major professor's name, telephone and email address: Not Applicable

#### **3. Affiliation (institution/agency/organization directly related to the proposed project):**

University of Hawaii, Hawaii Institute of Marine Biology

#### **4. Additional persons to be covered by permit. List all personnel roles and names (if known at time of application) here (e.g. John Doe, Research Diver; Jane Doe, Field Technician):**

Jon Dale, Research Diver & Field Technician

Yannis Papastamatiou, Research Diver & Field Technician

Tim Clark, Research Diver & Field Technician

TBD, Research Diver & Field Technician

TBD, Research Diver & Field Technician

## **Section B: Project Information**

### **5a. Project location(s):**

<input type="checkbox"/> Nihoa Island	<input type="checkbox"/> Land-based	<b><u>Ocean Based</u></b>	
<input type="checkbox"/> Necker Island (Mokumanamana)	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" type="checkbox"/> French Frigate Shoals	<input checked="" type="checkbox"/> Land-based	<input checked="" type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Gardner Pinnacles	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Maro Reef			
<input type="checkbox"/> Laysan Island	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Lisianski Island, Neva Shoal	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Pearl and Hermes Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Midway Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Kure Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Other			

NOTE: There is a fee schedule for people visiting Midway Atoll National Wildlife Refuge via vessel and aircraft.

### **Location Description:**

#### **Fishing/Tagging**

Field personnel will be based primarily at Tern Island field station (FFS) with supplemental ship-based activities. Shark tagging will occur in the shallow waters (<100m) around French Frigate Shoals. The exact locations of all shark captures will be recorded using a handheld GPS.

### **Receiver Deployment and Recovery**

Eight receivers are currently stationed in the shallow waters around FFS. The specific positions (latitude and longitude) of these units are given in Appendix 1, together with deployment depth and habitat characteristics. Up to thirty additional receivers will be deployed to increase monitoring coverage at French Frigate Shoals.

### **5b. Check all applicable regulated activities proposed to be conducted in the Monument:**

☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource

- ☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- ☒ Anchoring a vessel
- ☐ Deserting a vessel aground, at anchor, or adrift
- ☒ Discharging or depositing any material or matter into the Monument
- ☐ Touching coral, living or dead
- ☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- ☒ Attracting any living Monument resource
- ☐ Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)
- ☐ Subsistence fishing (State waters only)
- ☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

**6 Purpose/Need/Scope *State purpose of proposed activities:***

**(a) Purpose of proposed activities**

The purpose of our research is to provide Monument managers with empirical data on shark movement patterns and population sizes at French Frigate Shoals atoll. This information is vital for a better understanding of shark predation on Hawaiian monk seals and for selecting appropriate management strategies for mitigating predation impacts on monk seals. We have the following specific goals and objectives;

- (1) Download 8 underwater receivers currently stationed at FFS to retrieve stored movement data from sharks tagged with acoustic transmitters in 2008.
- (2) Determine the movement and habitat utilization patterns of these sharks, with specific emphasis on the frequency and timing of visits by Galapagos and tiger sharks to monk seal pupping sites inside the atoll lagoon.
- (3) Improve our receiver coverage by deploying up to thirty additional underwater receivers at French Frigate Shoals (Appendix 1).
- (4) Equip up to 100 additional galapagos sharks and 50 tiger sharks with acoustic tags detectable by our listening array. These tag deployments will enable us to reach adequate sample sizes to answer key questions about shark movements at FFS that will best inform seal predation mitigation strategies.

**(b) Need for proposed activities**

The Hawaiian monk seal (*Monachus schauinslandi*) is critically endangered with approximately 1,200 seals remaining and the total population size projected to fall below 1000 within the next five years. Among the six primary breeding sites in the NWHI, French Frigate Shoals (FFS) has experienced the most dramatic decline, with beach counts at FFS declining 70% from 1989-2004 (Antonelis et al. 2006, Caretta et al.,

2007). The main demographic factors in the decline have been poor juvenile survival (pup mortalities at FFS range from 15-69% of each annual cohort), exacerbated by lower reproductive rates as compared to other breeding sites in the NWHI (Harting et al. 2007). Shark predation is suspected to be the single greatest cause of mortality for pre-weaned Hawaiian monk seal pups at FFS, with a small number of persistent Galapagos sharks thought to be the primary culprits (although historically tiger sharks were considered the main predator of monk seals). These suspicions led to culling of 12 Galapagos sharks around a major monk seal pupping site (Trig Island, FFS) during 2000-2006 in an attempt to reduce pup predation. Despite shark culling and an overall decline in sightings of Galapagos sharks in shallow waters around pupping sites, pup losses continue. In 2008 a variety of potential shark deterrent devices were placed around Trig Island in a new attempt to reduce pup mortalities.

Anti-predation strategies implemented to date have been based on untested assumptions about shark behavior at FFS. We need a better understanding of shark movement patterns at FFS to identify the most effective anti-predation strategies. Several key questions must be addressed;

- (1) How frequently do large sharks (tiger and galapagos) visit monk seal pupping sites?
- (2) Do shark visits to monk seal pupping sites have predictable patterns?
- (3) What proportion of all Galapagos and tiger sharks tagged at FFS visit pupping sites?
- (4) Do individual sharks visit multiple pupping sites?
- (5) How much do shark movement patterns vary naturally over time?

(6) Do shark deterrents produce quantifiable changes in shark behavior around pupping sites?

(c) Scope of proposed activities

We propose to continue monitoring our existing transmitter-equipped sharks in order to determine how their movement patterns vary over multi year time-scales at FFS. This will require servicing and redeploying 8 existing receivers currently deployed at FFS (see Appendix 1). We also propose augmenting our monitoring coverage by deploying up to 30 additional underwater receivers at FFS to obtain higher resolution shark movement data from around monk seal pupping sites. We propose implanting acoustic transmitters into up to 100 additional galapagos sharks and 50 additional tiger sharks to address key questions listed in section b above (see also procedures, section c).

Cited References - see section 15

**7. Answer the Findings below by providing information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Monument:**

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?

The activity will be conducted with adequate safeguards for the resources and ecological integrity of the Monument. We use non-lethal catch and release, and acoustic monitoring techniques that have minimal impact on the resources and ecological integrity of the Monument. This project is a continuing effort to quantify top predator movements throughout the NWHI for the purpose of informing management. We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects?

The proposed activities will have minimal impact on the resources of the region. The research consists of non-lethal catch and release, and acoustic monitoring. This research is being conducted in concert with the priorities listed in the current draft NOAA research plan for the Monument. We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.

There is no practicable alternative to conducting activities in the Monument. We are addressing questions that are directly relevant to management of Monument resources (we are quantifying movement patterns of sharks at FFS atoll), hence the study must be carried out within the Monument.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?

The management value of data produced by our research activities outweighs the minor, transient impacts on Monument resources. The methods and procedures that we are proposing will have minimal impacts on Monument resources, qualities, and ecological integrity. No animals will be removed from the Monument and we have empirical data showing that tagged predators resume normal patterns of behavior within hours of release (e.g., Meyer et. al. 2007a,b). Our receivers are stationed on uncolonized habitats, and removal will leave no evidence of their presence (see Appendix 2). We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.

The actual fieldwork component of this research involves the minimum time required to reach the desired sample size of tagged sharks based on historical catch rates. The monitoring of shark movements is done remotely using small receivers left in situ year-round. The multi-year overall time frame of our proposed activities is consistent with our objectives of quantifying long-term movement patterns of sharks in Monument waters. Long-term studies are essential for identifying seasonal movements and determining how movement patterns vary over multi year time-scales.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

The principle investigator has more than a decade of experience conducting this type of research (see attached CV for details) and is well qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct. All personnel included in this permit application have extensive experience conducting research in the Monument, and in acoustic monitoring techniques. This is a continuance of a multi-year project. We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

g. Provide information demonstrating that you have adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

Our research is supported by an award to Hawaii Institute of Marine Biology from the National Marine Sanctuary Program (MOA 2005-008/6882), and we are provided access to the Monument on NOAA research vessels. We are also exploring the possibility of transporting personnel to Tern Island by aircraft. These resources are adequate to conduct and complete the proposed activities and mitigate any potential impacts resulting from its conduct.

h. Explain how your methods and procedures are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument cultural, natural and historic resources, qualities, and ecological integrity.

The methods and procedures that we are proposing are ideal for achieving our goals with minimal impacts to Monument resources, qualities, and ecological integrity. The use of passive monitoring techniques (self-contained acoustic receivers) means that we need relatively little human access to the Monument in order to achieve continuous, year-round monitoring of predator movements. No sharks will be removed from the Monument as a result of our research, and we have empirical data showing that tagged predators resume normal patterns of behavior within hours of release (e.g., Meyer et. al. 2007a,b). Our receivers are stationed on uncolonized habitats, and removal will leave no evidence of their presence (see Appendix 2). We are working with the Office of Hawaiian Affairs to seek guidance on how to mitigate potential cultural impacts associated with our research.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?

NOAA vessels are equipped with the NOAA OLE Vessel Monitoring System

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.

There are no other factors that would make the issuance of a permit for the activity inappropriate.

#### **8. Procedures/Methods:**

We will access sites within FFS using small boats launched from Tern Island. Predator capture and tagging will be conducted from these boats. Servicing of receivers will be done by snorkelers and SCUBA divers. We will require terrestrial access to Tern Island only, and will not be conducting night operations. Our chosen method (remote acoustic monitoring) is ideal for quantifying animal movements in remote, environmentally-sensitive locations because it has minimal environmental impact and requires only occasional, brief access by researchers to individual study sites, yet provides continuous monitoring of animal movements at those sites.

(a) Deployment of underwater receivers (see also Appendix 2)

We will create temporary receiver moorings using a system that has previously been empirically demonstrated to successfully withstand seasonal high surf. Moorings will consist of sand screws in areas of soft sediment, and chain around uncolonized substrate in hard bottom areas (live substrates will be avoided). We will remove these moorings when acoustic monitoring is completed (receivers will be in place for at least 2 years). The receivers will be anchored to the moorings and suspended 1-4 m above the ocean floor. The receivers will identify and record the presence of any acoustic transmitters within range (up to 500 m). The transmitter number, time of arrival and departure and the date will be recorded and stored until the data are downloaded from the receivers to a computer. The receivers have a battery life of approximately 15 months and will be serviced at 6 to 12 month intervals.

(b) Data retrieval, reduction and analysis.

We will download receivers currently deployed at FFS (Appendix 1). Data downloading consists of interfacing the receiver to a computer via a magnetically coupled probe and the serial port of the computer, and can be accomplished in the field. Preliminary data reduction and analyses will commence after downloading.

(c) Deployment of transmitters

We will implant acoustic transmitters into up to 100 galapagos sharks and up to 50 tiger sharks captured at FFS. Our predator handling & tagging activities will be carried out in accordance with the animal use protocols of the University of Hawaii (protocol #05-053). We will capture target species by handlining (using a single baited hook) from a small skiff and using a bottom-set, 10 hook shark line. Captured sharks will be brought alongside the skiff, tail-rope and inverted to initiate tonic immobility. In this trance-like condition, sharks remain docile while transmitters are surgically implanted. We will implant coded acoustic transmitters (V16, 9 mm diameter, 90 mm long, Vemco, Halifax, Nova Scotia) into the body cavities of each shark through a small incision in the abdominal wall (Holland et al., 1999; Meyer & Honebrink 2005, Meyer et al. 2007a,b). The incision will then be sutured closed, the hook removed and the shark released. This entire handling process can be completed in less than 10 minutes. Our acoustic transmitters have expected life spans of 2-10 years, thereby offering the possibility of detecting annual or seasonal patterns of movement and habitat use (Meyer et al. 2007a,b).

Cited References

Antonelis, G. A., J. D. Baker, T. C. Johanos, A. L. Harting, 2006. Abundance of the Hawaiian Monk Seal (*Monachus schauinslandi*): status and conservation issues. Atoll Research Bulletin 543:75-101.

Caretta, J. V., K. A. Forney, M. M. Muto, J. Barlow, J. Baker, B. Hanson, and M. Lowry. 2007. U.S. Pacific Marine Mammal Stock Assessment: 2006 NOAA-TMNMFS-SWFSC-398.

Harting, A. L., J. D. Baker, and T. C. Johanos. 2007. Reproductive patterns of the Hawaiian monk seal. *Marine Mammal Science* 23:553-573.

Holland KN, Wetherbee BM, Lowe CG and CG Meyer (1999) Movements of tiger sharks (*Galeocerdo cuvier*) in coastal Hawaiian waters. *Marine Biology* 134: 665-673.

Meyer CG and R Honebrink (2005) Retention of surgically implanted transmitters by bluefin trevally (*Caranx melampygus*). Implications for long-term movement studies. *Transactions of the American Fisheries Society*. 134:602-606.

Meyer CG, Papastamatiou YP, Holland KN. 2007. Seasonal, diel and tidal movements of green jobfish (*Aprion virescens*, Lutjanidae) at remote Hawaiian atolls: Implications for Marine Protected Area design. *Marine Biology*. 151: 2133-2143.

Meyer CG, Holland KN, Papastamatiou YP. 2007. Seasonal and diel movements of giant trevally (*Caranx ignobilis*) at remote Hawaiian atolls: implications for the design of Marine Protected Areas. *Marine Ecology Progress Series*. 333: 13-25.

**NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding, as a customized application will be needed. For more information, contact the Monument office on the first page of this application.**

**9a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):**

Common name:

N/A

Scientific name:

N/A

# & size of specimens:

N/A

Collection location:

N/A

☐ Whole Organism ☐ Partial Organism

**9b. What will be done with the specimens after the project has ended?**

N/A

**9c. Will the organisms be kept alive after collection?** ☐ Yes ☐ No

N/A

• General site/location for collections:

N/A

• Is it an open or closed system? ☐ Open ☐ Closed

N/A

• Is there an outfall? ☐ Yes ☐ No

N/A

• Will these organisms be housed with other organisms? If so, what are the other organisms?

N/A

• Will organisms be released?

N/A

**10. If applicable, how will the collected samples or specimens be transported out of the Monument?**

N/A

**11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:**

N/A

**12a. List all specialized gear and materials to be used in this activity:**

Please refer to Appendix 3

**12b. List all Hazardous Materials you propose to take to and use within the Monument:**

N/A

**13. Describe any fixed installations and instrumentation proposed to be set in the Monument:**

Please refer to Appendix 2

**14. Provide a time line for sample analysis, data analysis, write-up and publication of information:**

Analyses & interpretation of data are ongoing. We already have two manuscripts published in international peer-reviewed journals. We have a 3rd manuscript currently in review.

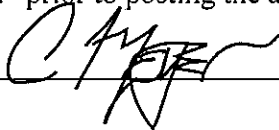
**15. List all Applicants' publications directly related to the proposed project:**

Meyer CG, Papastamatiou YP, Holland KN. 2007. Seasonal, diel and tidal movements of green jobfish (*Aprion virescens*, Lutjanidae) at remote Hawaiian atolls: Implications for Marine Protected Area design. *Marine Biology*. 151: 2133-2143.

Meyer CG, Holland KN, Papastamatiou YP. 2007. Seasonal and diel movements of giant trevally (*Caranx ignobilis*) at remote Hawaiian atolls: implications for the design of Marine Protected Areas. *Marine Ecology Progress Series*. 333: 13-25.

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as "confidential" prior to posting the application.

Signature



Date

9/1/08

**SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE  
BELOW:**

Papahānaumokuākea Marine National Monument Permit Coordinator  
6600 Kalaniana'ole Hwy. # 300  
Honolulu, HI 96825  
FAX: (808) 397-2662

**DID YOU INCLUDE THESE?**

- ☒ Applicant CV/Resume/Biography
- ☐ Intended field Principal Investigator CV/Resume/Biography
- ☒ Electronic and Hard Copy of Application with Signature
- ☐ Statement of information you wish to be kept confidential
- ☐ Material Safety Data Sheets for Hazardous Materials

## **Carl Meyer – Papahānaumokuākea FFS Shark Tagging**

### **Appendix 1 Activity Locations**

(1) We will recover, download and redeploy 8 receivers deployed at the following locations;

<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Habitat</b>
Rapture Reef	23.635090	-166.185700	Sand
Gins	23.726150	-166.189633	Sand
La Perouse	23.769450	-166.262083	Uncolonized hard bottom
East Island	23.786860	-166.207090	Sand
Round I	23.827467	-166.228567	Sand
Tern Island	23.866640	-166.288200	Sand
Trig Island	23.869453	-166.241583	Sand
N of Atoll	23.881833	-166.292233	Sand

## Carl Meyer – Papahānaumokuākea MNM Top Predator Tagging

### Appendix 2 Receiver installations in the Monument

We use Vemco VR2 underwater receivers for monitoring movements of transmitter-equipped predators. The VR2 consists of a hydrophone, receiver, ID detector, data logging memory, and battery all housed in a submersible plastic case.

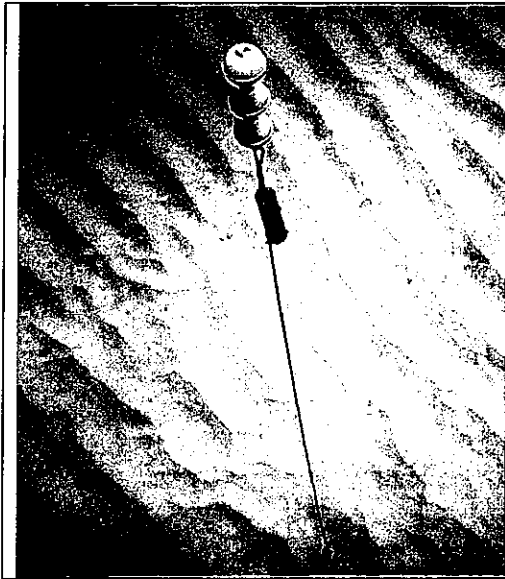


Vemco VR2 Receiver

Each receiver is mounted on a mooring consisting of an anchor (either a sand screw, or chain around uncolonized hard substrate), rope bridle and subsurface floats.

	<p>We use 4 ft steel sand screws which are literally screwed into the sand, leaving an eye loop exposed. This is the point of attachment for the rope bridle.</p>
	<p>Anti-chafing gear (heavy duty hose) protects the rope bridle at point of contact with the sand screw eye loop. We splice the rope bridle to the sand screw <i>in situ</i>.</p>

## Carl Meyer – Papahānaumokuākea MNM Top Predator Tagging



The finished installation, consisting of sand screw, rope bridle, VR2 receiver and subsurface floats.

We use the sand screw installation whenever possible. In hard-bottom areas we use chain around natural arches in lieu of sand screws (the other components are identical).

We service these installations every 6-12 months, at which time we completely replace all mooring components (anchors, rope bridles, floats), and download and re-battery the receivers.

We plan to maintain these installations for the duration of the acoustic monitoring research (at least 2 years). We will remove these installations on completion of the research. Removal is straightforward, takes less than 10 minutes per installation and leaves nothing behind.

## **Papahānaumokuākea Marine National Monument Compliance Information Sheet**

**1. Updated list of personnel to be covered by permit. List all personnel names and their roles here (e.g. John Doe, Diver; Jane Doe, Field Technician, Jerry Doe, Medical Assistant):**

Jon Dale (Field PI), HIMB,

Austin Stankus (Field Technician), HIMB,

Mike Burns (Field Technician), HIMB,

TBD (Field Technician)

**2. Specific Site Location(s): (Attach copies of specific collection locations):**  
Waters <200m depth in and around FFS. Up to 30 new VR2 receivers will be deployed around islands inside the FFS lagoon (Shark I., Tern I., Trig I., Round I., East I., Gins, Disappearing I.). Sharking fishing will occur at multiple locations inside the FFS lagoon and outside the atoll barrier reef.

We will recover, download and redeploy 8 receivers deployed at the following locations;

Location	Latitude	Longitude	Habitat
Rapture Reef	23.635090	-166.185700	Sand
Gins	23.726150	-166.189633	Sand
La Perouse	23.769450	-166.262083	Uncolonized hard bottom
East Island	23.786860	-166.207090	Sand
Round I	23.827467	-166.228567	Sand
Tern Island	23.866640	-166.288200	Sand
Trig Island	23.869453	-166.241583	Sand
N of Atoll	23.881833	-166.292233	Sand

**3. Other permits (list and attach documentation of all other related Federal or State permits):**

**3a. For each of the permits listed, identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Explain the circumstances**

**surrounding the violation or permit suspension, amendment, modification or revocation.**

Not Applicable

**4. Funding sources (Attach copies of your budget, specific to proposed activities under this permit and include funding sources. See instructions for more information):**

**Transport (ship):** NOAA is providing transportation for field personnel from Honolulu to Tern Island and from Tern Island to Midway on NOAA ship Oscar Elton Sette.

**Transport (aircraft):** HIMB will provide funds to fly personnel from Midway to Honolulu (\$25K is being budgeted for this purpose). Funds are being supplied as part of the HIMB/NOAA MOA support for research in the Monument.

**Accommodation:** USFWS will provide fieldwork personnel with ~90 days of room and board at the Tern Island field station under the terms of an HIMB/USFWS interagency agreement.

**Small boat for field ops:** NOAA is providing a 19ft Boston Whaler for fieldwork activities conducted from Tern Island.

**Fieldwork supplies:** Funds for telemetry and fishing supplies will be provided by NOAA (\$25,000 – supplies are in hand), the Marine Mammal Commission (\$32,000 pending approval of research proposal) and HIMB (\$30,000).

**5. Time frame:**

Activity start: May 2009

Activity completion: September 2011

Dates actively inside the Monument:

From: May 4, 2009

To: August 15, 2009

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application: **Departure dates from Midway need to be finalized.**

Personnel schedule in the Monument:

**Jon Dale, Austin Stankus, Mike Burns, TBD**

**May 5 – Enter Monument aboard NOAA ship Oscar Elton Sette**

**May 6 – Disembark at FFS**

**May 6 – August 12 (approx) Field ops based from Tern Island, FFS**

**August 12 (approx) – Embark NOAA ship Oscar Elton Sette**  
**August 13-14 – Transit to Midway**  
**August 15 (approx) – Depart Midway for Honolulu by aircraft**

**6. Indicate (with attached documentation) what insurance policies, bonding coverage, and/or financial resources are in place to pay for or reimburse the Monument trustees for the necessary search and rescue, evacuation, and/or removal of any or all persons covered by the permit from the Monument:**

**7. Check the appropriate box to indicate how personnel will enter the Monument:**

- ☒ Vessel  
☐ Aircraft

Provide Vessel and Aircraft information:

**NOAA ship Oscar Elton Sette**

**8. The certifications/inspections (below) must be completed prior to departure for vessels (and associated tenders) entering the Monument. Fill in scheduled date (attach documentation):**

- ☐ Rodent free, Date: TBD  
☐ Tender vessel, Date: TBD  
☐ Ballast water, Date: TBD  
☐ Gear/equipment, Date: TBD  
☐ Hull inspection, Date: TBD

**9. Vessel information (NOTE: if you are traveling aboard a National Oceanic and Atmospheric Administration vessel, skip this question):**

Vessel name:

Vessel owner:

Captain's name:

IMO#:

Vessel ID#:

Flag:

Vessel type:

Call sign:

Embarkation port:

Last port vessel will have been at prior to this embarkation:

Length:

Gross tonnage:

Total ballast water capacity volume (m3):

Total number of ballast water tanks on ship:  
Total fuel capacity:  
Total number of fuel tanks on ship:  
Marine Sanitation Device:  
Type:

Explain in detail how you will comply with the regulations regarding discharge in the Monument. Describe in detail. If applicable, attach schematics of the vessel's discharge and treatment systems:

Other fuel/hazardous materials to be carried on board and amounts:

Provide proof of a National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement-approved Vessel Monitoring System (VMS). Provide the name and contact information of the contractor responsible for installing the VMS system. Also describe VMS unit name and type:

VMS Email:  
Inmarsat ID#:

#### **10. Tender information:**

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? List the number of tenders/skiffs aboard and specific types of motors:

Monument 19ft Guardian (Boston Whaler). Equipped with 90Hp outboard + 9.9 Hp emergency outboard.

### **Additional Information for Land Based Operations**

#### **11. Proposed movement of personnel, gear, materials, and, if applicable, samples:**

Personnel and gear will be transported to FFS by NOAA ship Sette (May 4-6 estimated). Personnel and gear will be transported from NOAA ship Sette to Tern Island using the ship's tenders and the Monument 19ft whaler (May 6 estimated). Field operations at FFS will be conducted from Tern Island (no other terrestrial access is required). Personnel will be transported from FFS to Midway via NOAA ship Sette (August 12-14 estimated), and then from Midway to Honolulu via aircraft (August 15 estimated). No field ops will be conducted at Midway while personnel wait for their flight. Gear will be retrieved from Tern Island and returned to Honolulu via NOAA ship Sette (dates TBD).

#### **12. Room and board requirements on island:**

Room and board for 3 people is required at the Tern Island field station. This is being negotiated with USFWS and will be the subject of an interagency agreement between HIMB and USFWS. Standard field stations protocols will be followed by personnel while at Tern Island.

**13. Work space needs:**

Desk space for one person is being requested in the NOAA office section at the Tern Island field station. Other personnel may use the shared computer lab when available. Gear maintenance (rinsing boats, repairing fishing lines etc.) will take place in designated areas outside at Tern Island, and occasionally in the workshop facility. Freezers will be located in the utility structure east of the main field station barracks. Other work is all field based.

**DID YOU INCLUDE THESE?**

- ☒ Map(s) or GPS point(s) of Project Location(s), if applicable
- ☐ Funding Proposal(s)
- ☐ Funding and Award Documentation, if already received
- ☐ Documentation of Insurance, if already received
- ☐ Documentation of Inspections
- ☐ Documentation of all required Federal and State Permits or applications for permits